
Our ref: NIA/7057/16/6999/v3 Llay

24th January 2017

Mr. Andy McMullan
Knight Frank LLP



Sent by email only: andy.mcmullan@knightfrank.com

Dear Sirs

**NOISE IMPACT ASSESSMENT FOR A HYBRID PLANNING APPLICATION
PROPOSED MIXED-USE DEVELOPMENT OF LAND AT LLAY ROYAL BRITISH LEGION, WATTS
DYKE, LLAY, WREXHAM, NORTH WALES**

1.00 INTRODUCTION

- 1.01 Environmental Noise Solutions Ltd (ENS) have been commissioned by Knight Frank LLP, on behalf of its client The Royal British Legion, to carry out a noise impact assessment as part of a hybrid planning application for the proposed mixed-use development of land at Llay Royal British Legion (RBL), Watts Dyke, Llay, Wrexham, North Wales (hereafter referred to as the application site).
- 1.02 The proposals for the site are outlined below:
- Outline planning application for circa 63 no. residential dwellings.
 - Outline planning application for a 4000 sq ft retail unit with 26 no. parking spaces.
 - Detailed planning application for a new car park for the Llay RBL (40 no. spaces).
- 1.03 The objectives of the noise impact assessment were to:
- Determine the ambient noise climate at the application site (including potential noise associated with use of the existing Llay RBL).
 - Assess the potential noise impact of the ambient noise climate at the application site on the proposed development with reference to pertinent guidelines.
 - Assess the potential noise impact of the proposed development on the proposed and existing residential dwellings with reference to pertinent guidelines.
 - Provide mitigation measures, as necessary, in order to protect the amenity of the proposed and existing residential dwellings.
- 1.04 This report details the methodology and results of the assessment. It has been prepared to accompany a hybrid planning application to be submitted to Wrexham County Borough Council.
- 1.05 This report has been prepared for Knight Frank LLP and The Royal British Legion for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties making reference to the report should consult the above parties and ENS as to the extent to which the findings may be appropriate for their use.
- 1.06 A glossary of acoustic terms used in the main body of the text is contained in Appendix 1.

2.00 APPLICATION SITE SETTING AND PROPOSED DEVELOPMENT

- 2.01 The application site is located in a residential setting in the village of Llay, near Wrexham. Roughly rectangular in shape, the application site is bound by:
- The B5425 Llay New Road (a moderately-trafficked road) to the east.
 - Watts Dyke (a lightly-trafficked estate road) to the north.
 - Existing residential dwellings to the west.
 - Open fields to the south.
- 2.02 Outline planning permission is sought for the proposed residential and commercial aspects of the development. As a consequence the layout plan, consisting of circa 63 no. dwellings and a 4000 sq ft retail unit (with 26 no. car parking spaces) is preliminary (as shown in Appendix 2).
- 2.03 Notwithstanding this, the objective of the noise impact assessment is to assess whether the ambient noise climate represents a constraint to the proposed development, and the recommendations contained within this assessment can be refined at reserved matters stage once the layout is detailed.
- 2.04 The preliminary layout plan indicates that the residential development footprint is set back:
- Circa 10 metres from the B4525 Llay New Road.
 - Circa 4 metres from Watts Dyke.
 - Circa 16 metres from the southern façade of the Llay RBL.
- 2.05 The land directly to the north and west of the Llay RBL is to be developed as a new car park for the club (40 no. spaces) as part of detailed proposals.
- 2.06 The Llay RBL has a lounge and a function room which are used for scheduled events (e.g. dance classes, organ society meetings, live music events) and are also hired out for ad hoc day and evening events. The opening hours of the Llay RBL are as follows:
- Mon–Thu 1700–2300 hours
 - Friday 1500–0000 hours
 - Saturday 1200–0000 hours
 - Sunday 1200–2300 hours

3.00 BASELINE NOISE SURVEY AND NOISE BREAKOUT TESTS

- 3.01 In order to establish the ambient noise levels at the application site, a baseline noise survey was undertaken during the daytime and night time on Thursday 24th November 2016.
- 3.02 For the purpose of the assessment, the following noise monitoring positions were adopted (the approximate location of the noise monitoring positions is contained in Appendix 2 for reference):
- MP1 was located towards the eastern boundary of the application site at approximately 30 metres to the nearside kerb of the B4525 Llay New Road.
 - MP2 was located towards the northern boundary of the application site at approximately 10 metres to the nearside kerb of Watts Dyke.
- 3.03 Noise measurements were undertaken using a Bruel & Kjaer 2250 Type 1 integrating sound level meter. A windshield was fitted for all measurements. Measurements were made in a free field environment at 1.5 metres above local ground level. The measurement system calibration was verified immediately before the commencement of the measurement sessions and again at the end, using a Bruel & Kjaer Type 4231 calibrator.

- 3.04 The following table contains a summary of the measurement data for each measurement session, at each measurement position, rounded to the nearest decibel.

Table 3.1 – Noise Measurement Data

Position	Time	L _{Aeq} (dB)	L _{A90} (dB)	L _{A10} (dB)	L _{A1} (dB)	Comments
MP1	1254–1554	57	51	60	63	B5425 Llay New Road traffic (circa 400 vehicles / hour)
MP1	2301–0003	50	40	54	59	B5425 Llay New Road traffic (circa 60 vehicles / hour)
Daytime ambient noise level 57 dB L_{Aeq} (0700–2300) based on CRTN methodology Night time ambient noise level circa 49 dB L_{Aeq} (2300–0700) based on TRL methodology						
MP2	1613–1628	56	50	59	66	Watts Dyke traffic (circa 120 vehicles / hour)
MP2	0014–0029	43	34	46	54	1 car pass on Watts Dyke, occasional traffic on B5425 Llay New Road and distant traffic on A483.
Daytime ambient noise level 56 dB L_{Aeq, T} Night time ambient noise level circa 43 dB L_{Aeq, T}						

- 3.05 Ambient noise levels across the application site were associated with road traffic on the surrounding road network, with no other noise sources noted.
- 3.06 For the prediction of daytime road traffic noise, the Department of Transport's Memorandum on the Calculation of Road Traffic Noise (CRTN) explains that the following shortened measurement procedure may be used. Measurements of L_{A10} are made over any three consecutive hours between 10:00 and 17:00 hours. Using L_{A10} (3 hour) as the arithmetic mean of the three consecutive values of hourly L_{A10}, the L_{A10} (18 hour) can be calculated from the equation:
- (i)
$$L_{A10} (18 \text{ hour}) = L_{A10} (3 \text{ hour}) - 1 \text{ dB}$$
- 3.07 PPG24 further states that for road traffic noise:
- (ii)
$$L_{Aeq} (0700-2300) \approx L_{A10} (0600-0000) - 2 \text{ dB}$$
- 3.08 Substituting (ii) into (i) gives the following approximation:
- (iii)
$$L_{Aeq} (0700-2300) \approx L_{A10} (3 \text{ hour}) - 3 \text{ dB}$$
- 3.09 Based on the above formula, the daytime ambient noise level at MP1 is measured / calculated at **57 dB L_{Aeq} (0700–2300)**.
- 3.10 A study prepared by TRL Limited on behalf of the Department for Environment, Food and Rural Affairs (DEFRA) entitled 'Converting the UK Traffic Noise Index L_{A10} (18 hour) to EU Noise Indices for Noise Mapping' presents a methodology for calculating night time road traffic noise levels based on daytime road traffic noise level based on the following formula:
- (iv)
$$L_{Aeq} (23:00-07:00) \approx 0.90 * L_{A10, 18 \text{ hour}} - 3.77 \text{ (for non-motorways)}$$
- 3.11 Based on the above formula, the night time ambient noise level at MP1 is measured / calculated at **49 dB L_{Aeq} (2300–0700)**.
- 3.12 Daytime and night time ambient noise levels at MP2 (Watts Dyke) were measured at circa **56 dB L_{Aeq, T}** and **43 dB L_{Aeq, T}** respectively.
- 3.13 The preliminary layout plan indicates that the residential development footprint is set back:
- Circa 10 metres from the B4525 Llay New Road
 - Circa 4 metres from Watts Dyke

- 3.14 Correcting for distance, assuming worst case point-source propagation of –6 dB per doubling of distance (due to the relatively low traffic numbers on the surrounding road network), the design noise levels at the façades of road-fronting dwellings are as follows:
- **67 dB L_{Aeq} (0700–2300)** and **59 dB L_{Aeq} (2300–0700)** at 10 metres to the B4525 Llay New Road.
 - **64 dB L_{Aeq} (0700–2300)** and **51 dB L_{Aeq} (2300–0700)** at 4 metres to the Watts Dyke.
- 3.15 In addition to the external noise measurements, a noise breakout test was carried out in order to predict the impact of events at the Llay RBL on the proposed residential aspect of the development.
- 3.16 For reference, the (larger) function room has (non-openable) windows and an emergency fire door on its southern external wall, and no openings on its western external wall. The remaining walls of the function room are internal. The nearest proposed dwelling to the function room is located circa 16 metres to the fire door on the southern façade.
- 3.17 The (smaller) lounge has an emergency fire door on its eastern (road-fronting) external wall whilst all remaining walls are internal. The nearest proposed dwelling to the lounge is located circa 45 metres to the fire door.
- 3.18 On the basis of the above, noise breaking out through the function room fire door during a live event represents the worst case.
- 3.19 For the purpose of the noise breakout test, a reverberant internal noise level of 100 dB $L_{Aeq, T}$ was generated within the function room. Such levels are considered representative of worst case noise levels within the function room, based on previous measurements undertaken by ENS in comparable venues during a live event with drums.
- 3.20 The corresponding noise levels (based on a source level of 100 dB L_{Aeq}) were as follows:
- 84 dB L_{Aeq} at 2 metres to the southern façade of the Llay RBL with the fire door **open**.
 - 60 dB L_{Aeq} at 2 metres to the southern façade of the Llay RBL with the fire door **closed**.
 - Note: Fire door provides circa 24 decibels attenuation.
 - 77 dB L_{Aeq} at 4 metres to the southern façade of the Llay RBL with the fire door **open**.
 - 71 dB L_{Aeq} at 8 metres to the southern façade of the Llay RBL with the fire door **open**.
 - 64 dB L_{Aeq} at 16 metres to the southern façade of the Llay RBL with the fire door **open**.
 - Not audible at 16 metres to the southern façade of the Llay RBL with the fire door **closed**.
- 3.21 It was noted during the site visit that fire doors were very clearly marked with notices requiring the doors to be kept closed except in an emergency.
- 3.22 Although noise breakout was not audible/measurable over the ambient noise climate at 16 metres to the southern façade of the Llay RBL (considered representative of the nearest proposed dwelling façade) with the fire door **closed**, measurements in close proximity demonstrated a 24 decibel reduction due to the fire door.
- 3.23 On this basis, noise levels at the nearest dwelling façade are predicted to be **≤ 40 dB $L_{Aeq, T}$** (i.e. 64 dB $L_{Aeq, T}$ as measured (door open) – 24 dB reduction from fire door).

4.00 NOISE IMPACT ASSESSMENT CRITERIA

- 4.01 The National Planning Policy Framework (NPPF), came into force on 27 March 2012 and is a material consideration in planning decisions. At the heart of the NPPF is a presumption in favour of sustainable development, and the policies in Paragraphs 18 to 219 of the NPPF, taken as a whole, constitute the Government's view on what sustainable development in England means in practice for the planning system.
- 4.02 The NPPF states that there are three dimensions to sustainable development, which include an economic role (contributing to building a strong, responsive and competitive economy), a social role (providing the supply of housing required to meet the needs of present and future generations) and an environmental role (which includes minimising waste and pollution).
- 4.03 The NPPF supersedes Planning Policy Guidance Note 24 (PPG 24). The main policy statement in relation to noise is Paragraph 123 of the NPPF, which states *Planning policies and decisions should aim to:*
- *Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development*
 - *Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions*
 - *Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established*
- 4.04 In terms of noise impact assessment criteria, Paragraph 123 of the National Planning Policy Framework states that planning policies and decisions should aim to '*avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development*'.
- 4.05 Planning Practice Guidance specifically dealing with noise was uploaded to the Government's Planning Portal in March 2014 as an accompaniment to the National Planning Policy Framework. This guidance is summarised herein.
- 4.06 The guidance states that noise needs to be considered when new developments may create additional noise. Whilst noise can override other planning concerns, neither the Noise Policy Statement for England nor the National Planning Policy Framework (which reflects the Noise Policy Statement for England) expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of proposed development.
- 4.07 In order to determine noise impact, local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:
- Whether or not a significant adverse effect is occurring or likely to occur
 - Whether or not an adverse effect is occurring or likely to occur, and
 - Whether or not a good standard of amenity can be achieved
- 4.08 In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. In terms of Observed Effect Levels:
- No Observed Adverse Effect Level (NOAEL) – This is the level of noise exposure below which no effect at all on health or quality of life can be detected
 - Lowest Observed Adverse Effect Level (LOAEL) – This is the level of noise exposure above which adverse effects on health and quality of life can be detected, and
 - Significant Observed Adverse Effect Level (SOAEL) – This is the level of noise exposure above which significant adverse effects on health and quality of life occur

- 4.09 At the lowest extreme, when noise is not noticeable, there is by definition no effect. As the noise exposure increases, it will cross the no observed effect level as it becomes noticeable. However, the noise has no adverse effect so long as the exposure is such that it does not cause any change in behaviour or attitude. The noise can slightly affect the acoustic character of an area but not to the extent there is a perceived change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.
- 4.10 As the exposure increases further, it crosses the lowest observed adverse effect level boundary above which the noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise).
- 4.11 Increasing noise exposure will at some point cause the significant observed adverse effect level boundary to be crossed. Above this level the noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is above this level the planning process should be used to avoid this effect occurring, by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused.
- 4.12 At the highest extreme, noise exposure would cause extensive and sustained changes in behaviour without an ability to mitigate the effect of noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be prevented from occurring.

4.13 The following table summarises noise exposure hierarchy, based on likely average response.

Table 4.1 – Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not Noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

4.14 The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation. These factors include:

- The source and absolute level of the noise together with the time of day it occurs
- For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise
- The spectral content of the noise (i.e. whether or not the noise contains particular high or low frequency content) and the general character of the noise (i.e. whether or not the noise contains particular tonal characteristics or other particular features)
- The local acoustic character of the area

Residential Element of the Proposed Development

4.15 In addition to the National Planning Policy Framework Planning Practice Guidance on Noise, with respect to the residential elements of the proposed development, further useful contextual guidance is provided in BS 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings' (BS 8233).

- 4.16 BS8233 sets guideline indoor ambient noise levels for dwellings. These levels are reproduced in the following table.

Table 4.1 – Indoor Ambient Noise Levels in Dwellings (BS 8233:2014)

Activity	Location	Good Internal Conditions		Reasonable Internal Conditions	
		0700–2300	2300–0700	0700–2300	2300–0700
Resting	Living room	35 dB L_{Aeq}	–	40 dB L_{Aeq}	–
Sleeping (daytime resting)	Bedroom	35 dB L_{Aeq}	30 dB L_{Aeq}	40 dB L_{Aeq}	35 dB L_{Aeq}

- 4.17 Note 4 to the above table states ‘*Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or L_{AFMax} depending on the character and number of events per night. Sporadic noise events could require separate values.*

ENS note: it is evident that BS 8233 considers that night time maxima guideline values relate to discrete, individual noise events (such as aircraft or trains, etc) rather than general road traffic noise.

- 4.18 Note 5 to the above table states ‘*If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.*

- 4.19 Building Regulations Approved Document F ‘Ventilation’ (2010) states that for mainly naturally ventilated buildings, it is common to use a combination of ventilators (e.g. for dwellings it is common to use intermittent extract fans for **extract ventilation**, trickle ventilators for **whole dwelling ventilation** and windows for **purge ventilation**).

- 4.20 Purge ventilation throughout the building is to aid the removal of high concentrations pollutants and water vapour released from occasional activities such as painting and decorating and or accidental releases such as smoke and burnt food or spillage of water. Purge ventilation is intermittent i.e. required only when such activities occur. Purge ventilation provisions may also be used to improve thermal comfort, although this is **not controlled** under the Building Regulations.

ENS comment: it is evident that BS 8233 (and also the Building Regulations) considers that adequate ventilation is provided by open trickle ventilators.

- 4.21 With respect to garden amenity, BS8233 states:

For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

- 4.22 On the basis of the above, the following criteria are considered appropriate for the proposed residential development:

- 35 dB L_{Aeq} (0700-2300) in living rooms and bedrooms during the daytime.
- 30 dB L_{Aeq} (2300-0700) in bedrooms at night.
- ≤ 55 dB L_{Aeq} (0700-2300), or as low as practicable, in gardens during the daytime.

Commercial Elements of the Proposed Development

- 4.23 Further useful contextual guidance is found in British Standard BS 4142:2014 'Methods for Rating and Assessing Industrial and Commercial Sound' (BS 4142). BS 4142 describes methods for determining, at the outside of a building, noise levels from factories or industrial premises and a method for assessing whether the noise is likely to give rise to an adverse impacts at the nearest noise sensitive receptors.
- 4.24 BS 4142 considers that the likelihood of an adverse impact is dependent on the difference between the rating level and background noise level; the greater this difference the greater the likelihood of adverse impacts. BS 4142 further states: *Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context*
- 4.25 The rating level is described as the specific noise level (the equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference period) plus any adjustment for the characteristic features of the noise.
- 4.26 The background noise level is the A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 percent of a given time interval, T, measured using time weighting 'F' and quoted to the nearest whole number of decibels.

5.00 RECOMMENDATIONS FOR SOUND ATTENUATION SCHEME PROPOSALS

- 5.01 Outline planning permission is sought for the proposed residential development and, as a consequence, detailed layouts are not available at this stage. Notwithstanding this, it is assumed that the development footprint will largely follow the preliminary site plan, with dwelling facades circa 4 metres to the nearside kerb of Watts Dyke and circa 10 metres to the nearside kerb of the B4525 Llay New Road.
- 5.02 The ambient noise levels at the proposed dwelling facades fronting towards the B4525 Llay New Road have been measured / calculated at **67 dB L_{Aeq} (0700-2300)** and **59 dB L_{Aeq} (2300-0700)**.
- 5.03 The daytime and night time ambient noise levels at the proposed dwelling facades fronting towards Watts Dyke have been measured / calculated at circa **64 dB L_{Aeq, T}** and **51 dB L_{Aeq, T}** respectively.
- 5.04 Remaining habitable rooms at the development will be set back from the road network and screened by the road-fronting dwellings.
- 5.05 In order to calculate the sound insulation requirements of road-fronting façades at the application site, the Building Research Establishment (BRE) building envelope insulation calculation spreadsheet was used (see Appendix 3 for calculation spreadsheets). This spreadsheet is based on the calculation methodology advocated in BS 8233. The spreadsheet allows input of external noise levels, room dimensions and reverberation time together with parameters for the various elements of the building envelope and calculates the internal noise level in terms of the external noise level metric (L_{Aeq} in this case).

5.06 The scheme of sound insulation for the application site is set out in the following table.

Table 5.1 – Scheme of Sound Insulation Works

Location	Noise Level	Internal Criteria	Glazing and Ventilation
Habitable rooms fronting onto Llay New Road	67 dB L_{Aeq} (0700–2300) 59 dB L_{Aeq} (2300–0700)	≤ 35 dB L_{Aeq} (0700–2300) ≤ 30 dB L_{Aeq} (2300–0700)	Double glazing rated at ≥ 34 dB R_w+C i.e. enhanced 10/(6-20)/6 and acoustic trickle vent *
Habitable rooms fronting onto Watts Dyke	64 dB L_{Aeq} (0700–2300) 51 dB L_{Aeq} (2300–0700)	≤ 35 dB L_{Aeq} (0700–2300) ≤ 30 dB L_{Aeq} (2300–0700)	Double glazing rated at ≥ 34 dB R_w+C i.e. enhanced 10/(6-20)/6 and acoustic trickle vent *
Remaining habitable rooms set back/screened from the road network			Double glazing rated at ≥ 29 dB R_w+C i.e. standard 4/(6-20)/4 and standard trickle vents.

* Acoustic trickle vents rated at least 42 dB $D_{n,e,w}$ (vent open), such as the Greenwood 5000EAW.AC2 (note: 1 no. required per habitable room) or the Greenwood 2500EAW.AC2 (note: 2 no. required per habitable room) – ventilation requirements to be confirmed by developer.

5.07 A detailed building envelope specification can be provided when the detailed layout is determined (as part of a Reserved Matters application). The ambient noise climate at the application site is, however, suitable for residential development.

5.08 In accordance with good acoustic practice, the preliminary layout indicates that the gardens of road-fronting dwellings are located to the rear and therefore screened by the dwellings themselves. On this basis there is no issue with respect to garden amenity.

Noise associated with the Llay Royal British Legion

5.09 Worst case predicted noise levels at the nearest proposed dwelling façade (16 metres to the fire door) associated with use of the Llay RBL function room are ≤ 40 dB $L_{Aeq, T}$.

5.10 Such levels are relatively low. For reference the World Health Organisation's Night Noise Guidelines Europe (2009) state '*an external noise level of 40 dB L_{Aeq} (2300–0700) represents the Lowest Observed Adverse Effect Level.*'

5.11 It is therefore concluded that the impact associated with noise breakout from the function room to the proposed residential development is negligible.

5.12 For use of the proposed Llay RBL car park during the night time period consideration also needs to be given to discrete event maxima such that they would not give rise to sleep disturbance. WHO Guidelines on Community Noise states that in order to sleep with windows partially open, maximum noise levels outside a dwelling should generally not exceed **60 dB L_{AFMax}** more than 10 to 15 times per night.

5.13 The proposed new car park area is ≥ 5 metres to the nearest proposed dwelling façade. Monitoring previously undertaken by ENS at various car parks have recorded maximum noise levels of circa 65 dB L_{AFMax} associated with car door slams at 5 metres.

5.14 In order to reduce maximum noise levels to < 60 dB L_{AFMax} at the nearest proposed dwelling façades, it is recommended that a 1.8 metre high close-boarded timber fence is installed along the western boundary of the car park, such that the nearest car parking bays are fully screened (see Appendix 2 for location of fence).

5.15 The fence should have a superficial mass of at least 10 kg/m² and the panels should be rigidly mounted and there should be no gaps between adjacent panels, or the barrier and the ground. The fence should be designed (e.g. through the use of cover strips) so that gaps do not develop between abutting panels through warping or shrinking.

- 5.16 For reference, BS 5228:2009 Part 1 states *'In the absence of spectral data, as a working approximation, if there is a barrier or other topographic feature between the source and the receiving position, assume an approximate attenuation of 5 dB when the top of the plant is just visible to the receiver over the noise barrier, and of 10 dB when the noise screen completely hides the sources from the receiver. High topographical features and specifically designed and positioned noise barriers could provide greater attenuation.'* It is therefore considered appropriate to allow at least 10 decibels screening attenuation for the fence.

Commercial Elements of the Proposed Development

- 5.17 At the time of writing, the occupancy of the proposed retail unit is not known. However, it is anticipated that the proposed retail unit may include fixed installations (mechanical and electrical plant and equipment) that could have the potential to generate noise.
- 5.18 It is therefore considered appropriate to specify suitable noise limits to which any external plant items should conform. These limits should take account of the background noise level at the nearest noise sensitive receptors.
- 5.19 Daytime and night time background noise levels in the vicinity of the proposed retail unit (MP1) were measured at circa 51 dB $L_{A90, T}$ and 40 dB $L_{A90, T}$ respectively.
- 5.20 Based upon the principles of BS 4142, it is considered appropriate that the noise **rating** level of any external plant at the proposed retail unit should not exceed **51 dB L_{Aeq}** during the daytime and **40 dB L_{Aeq}** during the night time period in a free field position at any surrounding (existing or proposed) residential dwellings.
- 5.21 This is considered robust with respect to the night time period, since the World Health Organisation's Night Noise Guidelines Europe (2009) state *'an external noise level of 40 dB $L_{Aeq} (2300-0700)$ represents the Lowest Observed Adverse Effect Level.'*
- 5.22 It is considered that appropriate noise control can be achieved with the judicious selection of plant and/or standard noise mitigation techniques. It is considered that this aspect of the proposed development is amenable to an appropriately worded planning condition.
- 5.23 The potential noise impact of deliveries at the unit will primarily depend upon the requirements of the occupier. However, noise associated with daytime deliveries at the unit is likely to be negligible due to the masking effects of the B5425 Llay New Road.
- Note: If night time deliveries are sought, then it may be necessary to assess the impact of discrete event maxima with respect to sleep disturbance at the nearest existing and proposed dwellings.

6.00 CONCLUSIONS

- 6.01 A noise impact assessment has been undertaken as part of a hybrid planning application for the proposed mixed-use development of land at Llay Royal British Legion (RBL), Watts Dyke, Llay, Wrexham, North Wales.
- 6.02 The ambient noise climate across the application site is attributable to road traffic on the surrounding road network.
- 6.03 An outline scheme of sound attenuation works has been developed to protect the proposed residential development from the ambient noise climate in accordance with pertinent guidelines. On this basis, the ambient noise climate does not pose a constraint to the proposed residential development.
- 6.04 It is concluded that the control of noise associated with any fixed external plant within the commercial element of the development can be achieved with the judicious selection of plant and/or standard noise mitigation techniques and that this aspect of the proposed development is amenable to a suitably worded planning condition.

I trust the foregoing is sufficient for your needs. Should you have any queries regarding the above, please do not hesitate to contact me.

Yours sincerely



Thomas Crabb
MIOA, Diploma in Acoustics & Noise Control, BSc (Hons)
Environmental Noise Solutions Limited

Appendix 1

Glossary of Acoustic Terms

Sound Pressure Level (L_p)

The basic unit of sound measurement is the sound pressure level. As the pressures to which the human ear responds can range from 20 μPa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$$L_p = 20 \log_{10}(p/p_0)$$

Where L_p = sound pressure level in dB; p = rms sound pressure in Pa; and p_0 = reference sound pressure (20 μPa).

A-weighting Network

A frequency filtering system in a sound level meter, which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed in dB(A), has been shown to correlate well with subjective response to noise.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$

The value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval, T , has the same mean-square sound pressure as a sound that varies with time. $L_{Aeq, 16h}$ (07:00 to 23:00 hours) and $L_{Aeq, 8h}$ (23:00 to 07:00 hours) are used to qualify daytime and night time noise levels.

$L_{A10, T}$

The A-weighted sound pressure level in decibels exceeded for 10% of the measurement period, T . $L_{A10, 18h}$ is the arithmetic mean of the 18 hourly values from 06:00 to 24:00 hours.

$L_{A90, T}$

The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T . L_{A90} is typically taken as representative of background noise.

$L_{AF \max}$

The maximum A-weighted noise level recorded during the measurement period. The subscript 'F' denotes fast time weighting, slow time weighting 'S' is also used.

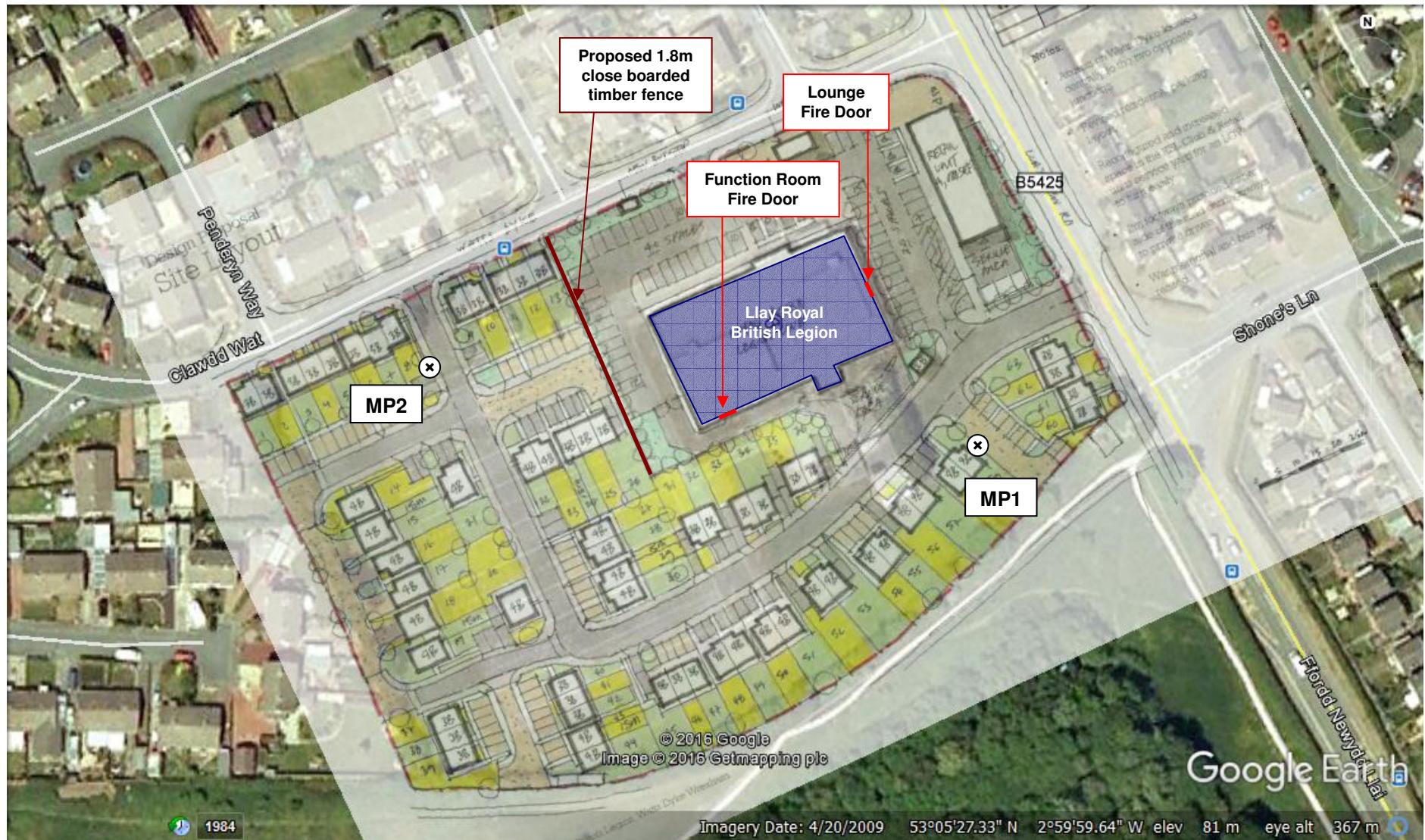
Sound Exposure Level (SEL or L_{AE})

The energy produced by a discrete noise event averaged over one second, no matter how long the event actually took. This allows for comparison between different noise events which occur over different lengths of time.

Weighted Sound Reduction Index (R_w)

Single number quantity which characterises the airborne sound insulation properties of a material or building element over a defined range of frequencies (R_w is used to characterise the insulation of a material or product that has been measured in a laboratory).

Appendix 2
Preliminary Site Layout and Approximate Noise Monitoring Positions



Appendix 3 BRE Calculation Spreadsheets

B4525 Llay New Road elevation – Daytime (worst case) ambient noise levels

BRE		Building Envelope Insulation		Switch to Reverberation Time Calculation																															
1) Enter room dimensions or volume ☐ Use dimensions x m y m z m Volume m ³ OR ☒ Use volume 25 m ³		2) Select elements of facade structure, and enter corresponding internal surface area in m ² OR enter number of vents.		Surface area OR number of vents																															
		<table border="1"> <tr> <td>Wall 1</td> <td>Brick / block cavity</td> <td>9</td> <td>m²</td> </tr> <tr> <td>Wall 2</td> <td>None</td> <td></td> <td>m²</td> </tr> <tr> <td>Window 1</td> <td>10/ 12/ 6 double glazing</td> <td>1.2</td> <td>m²</td> </tr> <tr> <td>Window 2</td> <td>None</td> <td></td> <td>m²</td> </tr> <tr> <td>Door</td> <td>None</td> <td></td> <td>m²</td> </tr> <tr> <td>Roof/ Ceiling</td> <td>None</td> <td></td> <td>m²</td> </tr> <tr> <td>Vent 1</td> <td>Greenwood 5000EAW .AC2</td> <td>1</td> <td></td> </tr> <tr> <td>Vent 2</td> <td>None</td> <td></td> <td></td> </tr> </table>		Wall 1	Brick / block cavity	9	m ²	Wall 2	None		m ²	Window 1	10/ 12/ 6 double glazing	1.2	m ²	Window 2	None		m ²	Door	None		m ²	Roof/ Ceiling	None		m ²	Vent 1	Greenwood 5000EAW .AC2	1		Vent 2	None		
Wall 1	Brick / block cavity	9	m ²																																
Wall 2	None		m ²																																
Window 1	10/ 12/ 6 double glazing	1.2	m ²																																
Window 2	None		m ²																																
Door	None		m ²																																
Roof/ Ceiling	None		m ²																																
Vent 1	Greenwood 5000EAW .AC2	1																																	
Vent 2	None																																		
		3) Enter reverberation time of the room.		0.5 seconds																															
				4) Select exterior sound level type Option (A) ☒ User defined spectrum 67 dB LAeq View/ Edit Data Option (B) ☐ Spectrum shape Select spectrum shape and enter free field exterior sound level, L _{Aeq} (considering only the octave bands between 125Hz and 2kHz) L _{Aeq} 67 dB ISO 717 - 1 (C) View Data																															
				Internal sound level L _{Aeq} 32.1 dB																															

Watts Dyke elevation – Daytime (worst case) ambient noise levels

BRE		Building Envelope Insulation		Switch to Reverberation Time Calculation																															
1) Enter room dimensions or volume ☐ Use dimensions x m y m z m Volume m ³ OR ☒ Use volume 25 m ³		2) Select elements of facade structure, and enter corresponding internal surface area in m ² OR enter number of vents.		Surface area OR number of vents																															
		<table border="1"> <tr> <td>Wall 1</td> <td>Brick / block cavity</td> <td>9</td> <td>m²</td> </tr> <tr> <td>Wall 2</td> <td>None</td> <td></td> <td>m²</td> </tr> <tr> <td>Window 1</td> <td>10/ 12/ 6 double glazing</td> <td>1.2</td> <td>m²</td> </tr> <tr> <td>Window 2</td> <td>None</td> <td></td> <td>m²</td> </tr> <tr> <td>Door</td> <td>None</td> <td></td> <td>m²</td> </tr> <tr> <td>Roof/ Ceiling</td> <td>None</td> <td></td> <td>m²</td> </tr> <tr> <td>Vent 1</td> <td>Greenwood 5000EAW .AC2</td> <td>1</td> <td></td> </tr> <tr> <td>Vent 2</td> <td>None</td> <td></td> <td></td> </tr> </table>		Wall 1	Brick / block cavity	9	m ²	Wall 2	None		m ²	Window 1	10/ 12/ 6 double glazing	1.2	m ²	Window 2	None		m ²	Door	None		m ²	Roof/ Ceiling	None		m ²	Vent 1	Greenwood 5000EAW .AC2	1		Vent 2	None		
Wall 1	Brick / block cavity	9	m ²																																
Wall 2	None		m ²																																
Window 1	10/ 12/ 6 double glazing	1.2	m ²																																
Window 2	None		m ²																																
Door	None		m ²																																
Roof/ Ceiling	None		m ²																																
Vent 1	Greenwood 5000EAW .AC2	1																																	
Vent 2	None																																		
		3) Enter reverberation time of the room.		0.5 seconds																															
				4) Select exterior sound level type Option (A) ☒ User defined spectrum 64 dB LAeq View/ Edit Data Option (B) ☐ Spectrum shape Select spectrum shape and enter free field exterior sound level, L _{Aeq} (considering only the octave bands between 125Hz and 2kHz) L _{Aeq} 64 dB ISO 717 - 1 (C) View Data																															
				Internal sound level L _{Aeq} 31.4 dB																															